

Dysregulation of the Metabolic-Inflammatory Axis in Progressive Multiple Sclerosis

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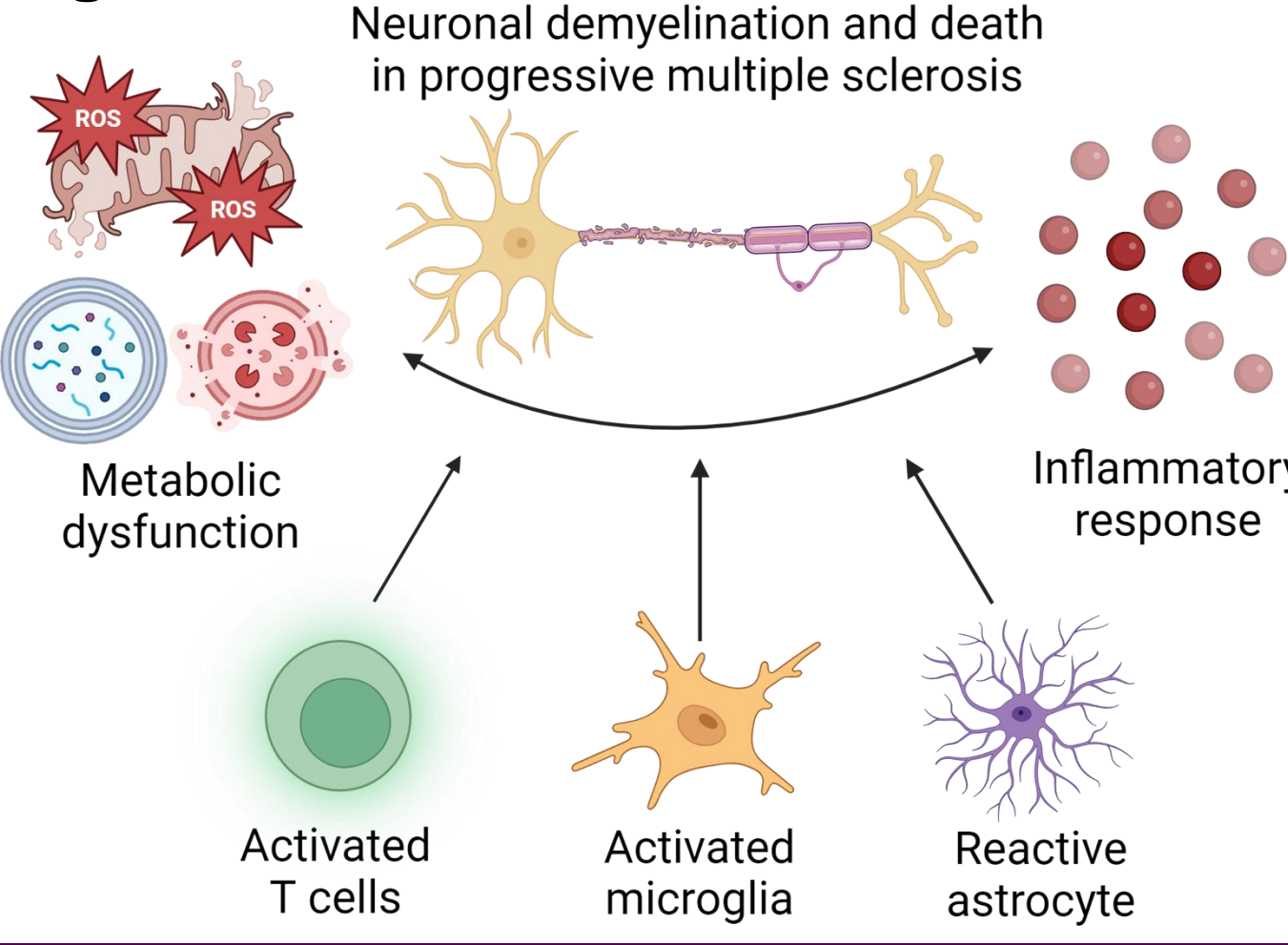
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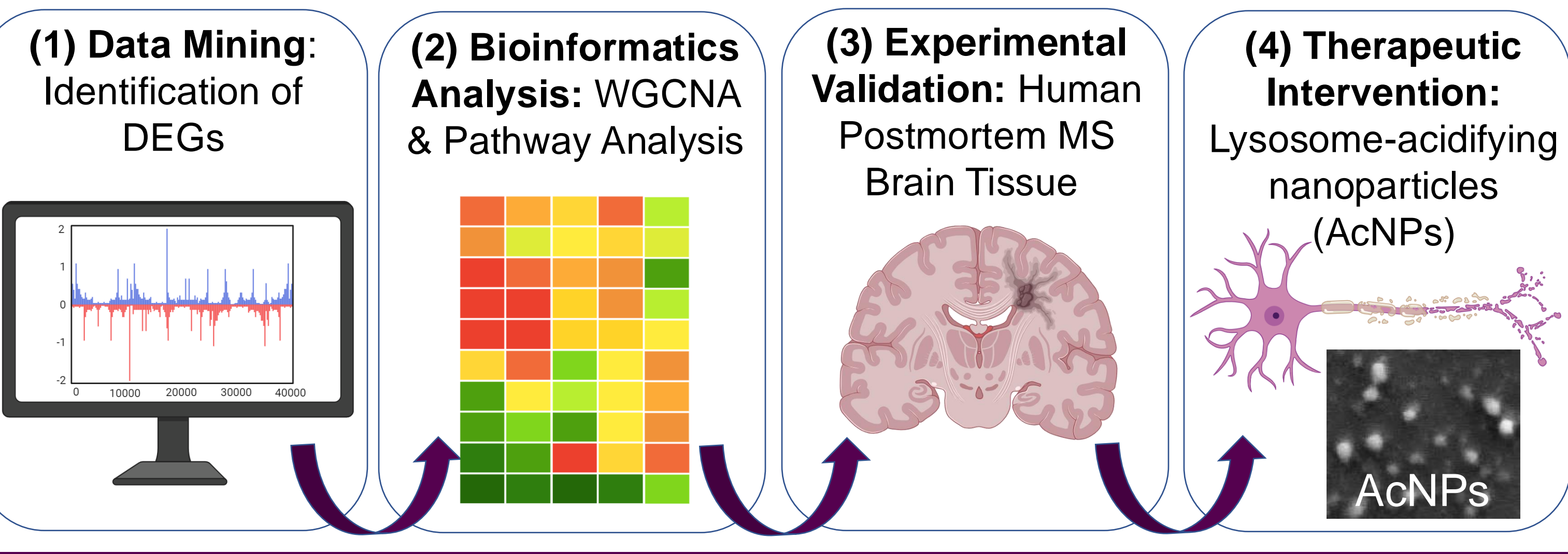
Metabolic-Inflammatory Axis in Multiple Sclerosis (MS)

- Recent studies have suggested that disruptions in metabolic processes such as mitochondrial activity as well as autophagy and lysosomal functions play a critical role in the pathogenesis of progressive multiple sclerosis (MS) by compromising energy production and waste clearance¹⁻³.
- Metabolic dysfunctions such as elevated oxidative stress intensify inflammatory responses within the central nervous system, leading to demyelination and progressive neuronal loss^{4,5}.

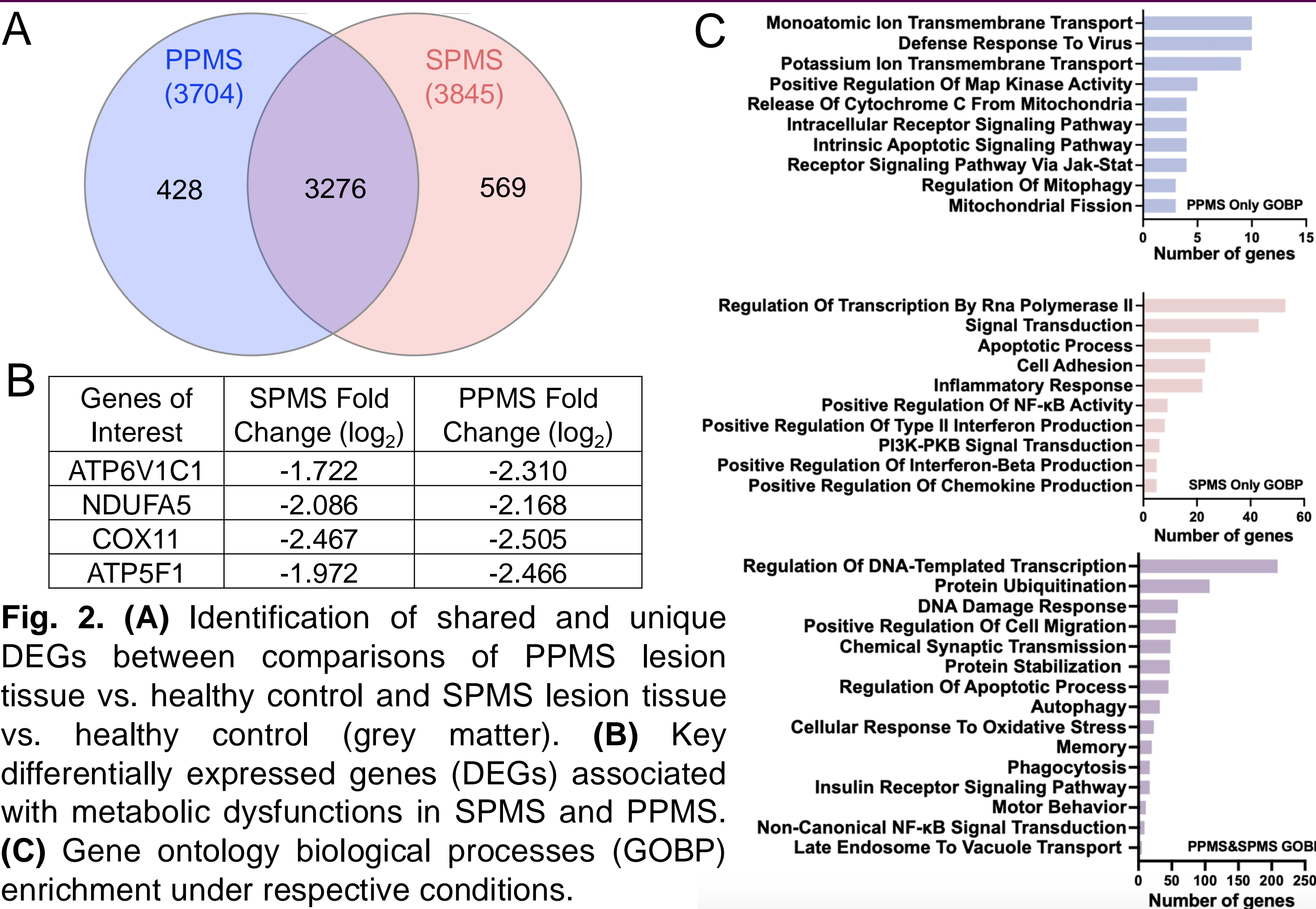
Fig. 1. Dysregulation of metabolic-inflammatory axis



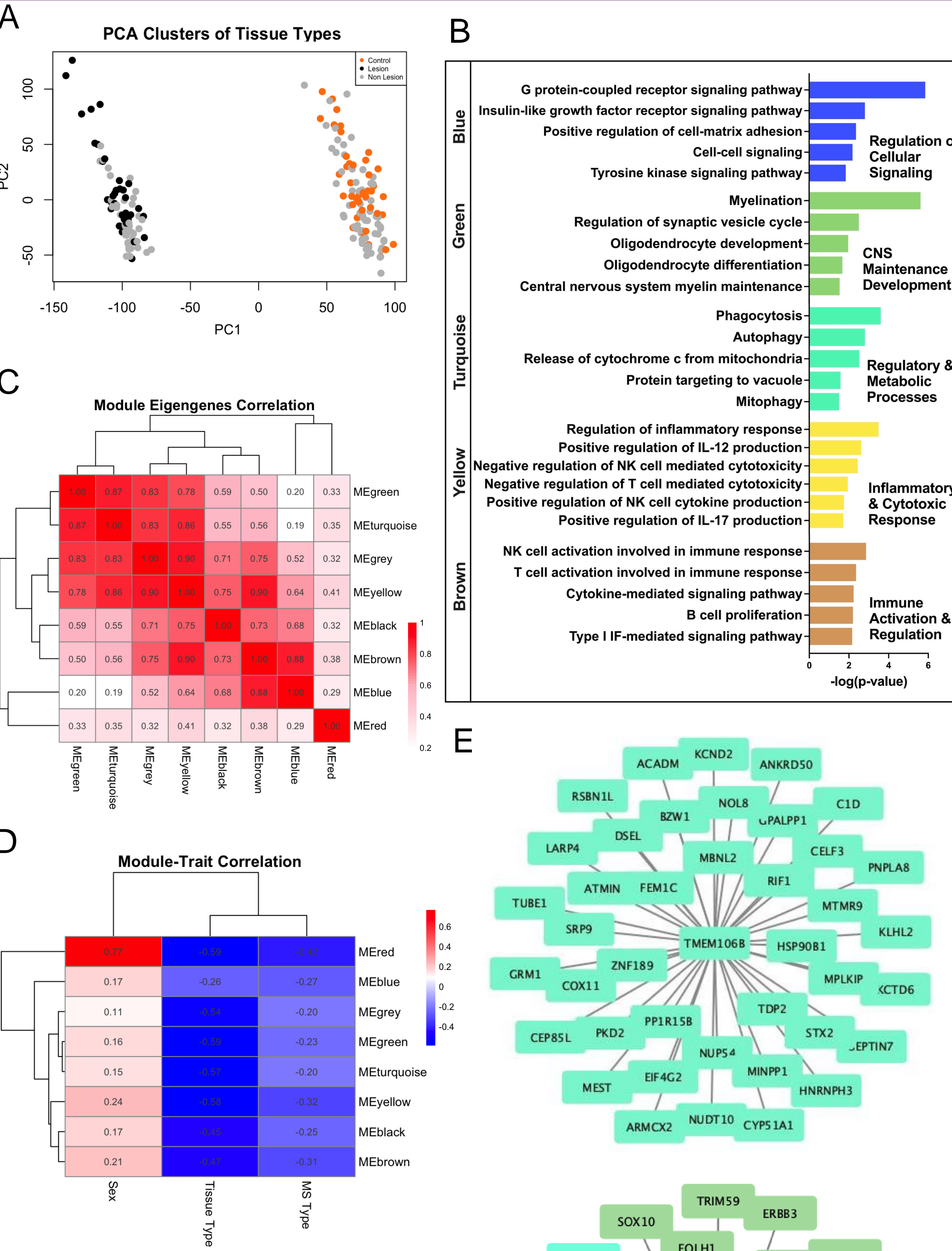
Computational to Experimental: Uncovering MS Mechanism



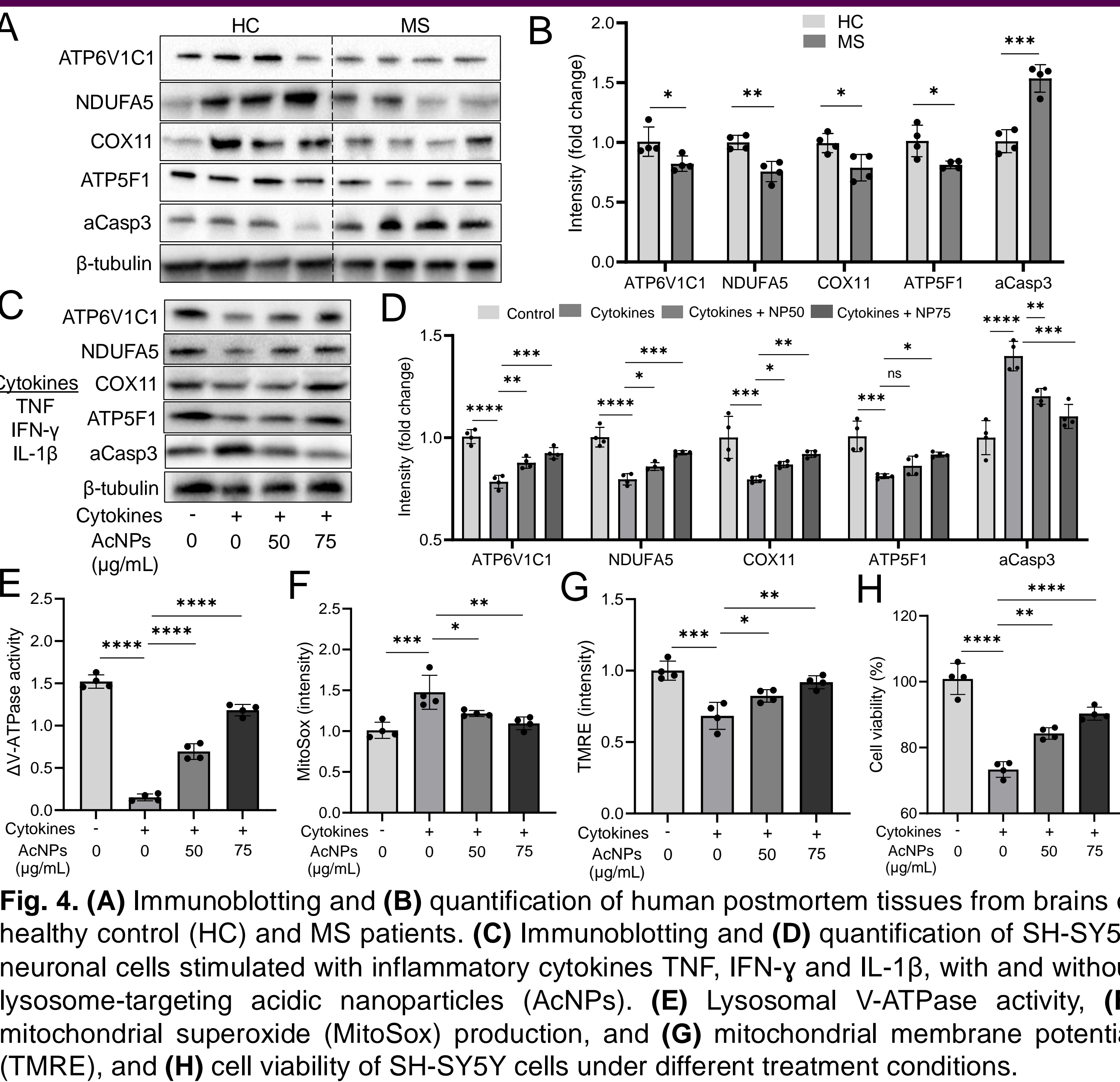
Distinct and Shared Biological Pathways in Progressive MS



Interconnected Gene Modules in MS Lesions



Validation in Human MS Brain Tissues and Neuronal Cells



Relevant Publications from the Lab

- O'Connor LM et al. Integrative multi-omics and systems bioinformatics in translational neuroscience: A data mining perspective. *J Pharm Anal.* 2023;13(8):836-850.
- O'Connor LM et al. Data Mining of Microarray Datasets in Translational Neuroscience *Brain Sciences.* 2023;13(9):1318.
- Pitt D et al. Toward precision phenotyping of multiple sclerosis. *Neurol Neuroimmunol & Neuroinflamm.* 2022;9(6)
- Lo CH et al. Astrocyte heterogeneity in multiple sclerosis: current understanding and technical challenges. *Front Cell Neurosci.* 2021;15:726479.

Summary and Future Work

- Metabolic and inflammatory pathways are differentially regulated in progressive MS, suggesting a crosstalk within the metabolic-inflammatory axis.
- Future work: (1) Dissect cell-type specific contributions to metabolic dysregulation & (2) Develop novel therapies for treatment of progressive MS

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